

## **Puget Sound Georgia Basin Research Conference 2005**

### **Session F7 Restoration: Illustrating Process Based Restoration II**

#### **Seahurst Park: Restoring Nearshore Habitat and Reconnecting Natural Sediment Supply Processes**

Peter Hummel, Anchor Environmental  
Scott Thomas, City of Burien  
Jeff Dillon, U.S. Army Corps of Engineers  
Jim Johannessen, Coastal Geologic Services  
Paul Schlenger, Anchor Environmental  
William T. Laprade, Shannon & Wilson

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#### **Introduction:**

Most of Puget Sound's beaches depend on a sediment supply originating from unstable and eroding coastal bluffs (Keuler 1988). Therefore the management of this sediment source has significant implications for Puget Sound's beaches and the nearshore ecosystem in general. With almost one mile of beach, Seahurst Park is one of largest shoreline parks on Puget Sound. Its shoreline is a microcosm of Puget Sound habitats with extensive bulkheading, unbulkheaded areas, unstable forested bluffs, extensive eelgrass beds, and perennial stream deltas. As such, the park provides an excellent opportunity to restore natural beaches, habitat forming processes, and to monitor the physical and biological response to these actions. A master planning effort was completed by the City of Burien (City) in 2002, with Salmon Recovery Funding Board (SRFB) grant support. A first phase of beach restoration was completed at the south 1200 linear feet of the park by the U.S. Army Corps of Engineers (Corps) in February, 2005.

#### **Project Location and Background:**

The park is located on the east shore of Central Puget Sound 15 miles south of downtown Seattle. Developed as a King County Regional Park in 1972, Seahurst Park was transferred to the City of Burien in 1997 after the City incorporated. The development of the park included bulkheading the majority of the park's shoreline with a combination of rock filled gabions and concrete seawalls in order to expand upland park and trail areas, and to create sandy "perched beaches" in some areas (Anchor Environmental 2002a). Subsequent failures of the gabions and perched beaches led to increasing reliance on larger rock rip-rap by the County. In addition, small landslides in the forested bluffs occurred at regular intervals (two to five years apart), disrupting the shoreline park areas with localized piles of soil, logs and vegetation that were then trucked to an upland disposal site. The combination of bulkhead-induced erosion from reflected wave energy, and loss of sediment supply resulted in a three- to four- foot lowering of the upper beach grade along most of the park's shorelines between 1972 and 2002 (Coastal Geologic Services 2004).

#### **Site and Regional Context:**

Seahurst Park includes approximately 4000 feet of shoreline and of 152 acres of steep, forested coastal bluffs, and ravines. The site contains of two primary ravine drainages with unnamed perennial streams. Forested bluffs fronting the shoreline are geologically unstable and prone to frequent, shallow, small slides, as opposed to infrequent deep seated slides occurring in other locations (Anchor Environmental 2002a). Prior to development, these bluffs and streams supplied sediment to the site's beaches, which was then conveyed north by longshore transport. The park is located within one half mile of the updrift end of one of the longest driftcells in King County. Therefore, historically and to a more limited extent now, the park and the undeveloped private shoreline to the south, function as a sediment source for beaches many miles to the north. Since most of the eastern Puget Sound shoreline in King County is developed and bulkheaded, King County and Water Resource Inventory Area 9 (WRIA 9) identified Seahurst Park as a very high priority nearshore restoration site and have helped the City of Burien obtain SRFB grant funding for studies and restoration. The County has also conducted juvenile salmon beach seining there for several years (Brennan et al. 2004).

In addition to its coastal geologic importance for sediment supply, the park's shoreline contains habitats that support juvenile and adult salmon, and salmon prey species. These habitats include an extensive intertidal and shallow subtidal terrace that supports a dense bed of eelgrass (*Zostera marina*) and documented forage fish (sand lance and

surf smelt) spawning beaches (Williams et al. 2001). However, bulkheading from park development in the 1970's and previous modifications have degraded much of this mid to upper intertidal habitat, lowering their ecological function for use by salmon and forage fish (Penttila pers. comm.).

### **Seahurst Park Master Plan:**

As a key component of park master planning, the City obtained SRFB grant funding for a bulkhead alternatives analysis to address these issues. Anchor Environmental worked with the City, the community, and assembled a team of experts in geology and nearshore ecology to perform the analysis and develop the master plan. This analysis resulted in a five pronged strategy to restore and protect nearshore habitats and restore habitat forming processes:

1. Preserve existing functioning nearshore habitats including unstable forested bluffs, eelgrass beds, and stream deltas.
2. Remove existing shoreline protection structures, such as bulkheads, consistent with existing and proposed park uses. Note: this was compatible in nearly all areas, except for a short segment near the existing Marine Technology Center building.
3. Model restored beach slopes and substrates after natural conditions found on-site and on adjacent reference beaches to provide habitat for forage fish spawning and public recreation.
4. Replenish gravel and sand lost to erosion since the park was developed with imported and on-site materials.
5. Restore and protect the natural delivery paths of sediment and woody debris from the hillsides to the beach.

Master planning also involved significant public involvement. The public involvement process demonstrated strong public support for shoreline habitat restoration. However, this community involvement process also showed that the public strongly valued continued pedestrian access to the shoreline for walking, picnicking, and other passive recreation uses. Therefore balancing the need the need for habitat restoration and public shoreline access was a key component of the master plan (reference master plan summary report).

### **Phase I South Seawall Shoreline Restoration:**

The southern 1,200 linear feet of the park's beach has been restored following this strategy as the first phase of master plan implementation. The first phase of restoration targeted transformation of the most failure-prone gabion bulkhead/rip-rap revetment into a natural beach supporting juvenile salmon, forage fish (sand lance and surf smelt) and other species. Beach restoration was conducted by the Corps using their newly created Puget Sound and Adjacent Water funding authority. The project was designed to avoid impacts to existing eelgrass, and potentially afford expansion of the beds. All gabion baskets and rock rip-rap were removed from the beach. Two layers of material were imported: a base gravel layer (3 inch to 0.5 inch natural gravel), and a sand/gravel surface layer (1.5 inch to coarse sand). This material brought grades up to pre-bulkhead elevations. Large woody debris was salvaged from the beach and clearing operations and later placed in the backshore and upper intertidal zone. All of the gabion rock was salvaged to construct a new path further landward from the beach, and much of the large stone was salvaged and stockpiled for future hillside trail work (rockery construction). All of the sandy soils were stockpiled and re-used in front of an existing picnic shelter. Approximately 3000 cubic yards (CY) were barged off-site and approximately 9000 CY of sand and gravel were imported. The beach restoration project and subsequent native vegetation restoration is a partnership between the City, the Corps, and the SRFB.

SRFB grant funding will be used to restore beach vegetation and riparian woody vegetation in the shoreward portion of the area where work was conducted by the Corps. Restoration of shoreline riparian planting is planned for fall 2005/winter 2006. A final, trail and picnic area relocation project using other City and state grant funds is scheduled for 2007. Some trail and picnic facilities were removed to construct the habitat restoration project. These are being relocated and reconfigured consistent with the master plan in order to provide pedestrian and recreational use that is compatible with the restored habitats and geologically unstable bluff conditions.

### **Pre and Post-Construction Monitoring:**

Monitoring of the South Seawall Shoreline Restoration project consists of pre and post-construction, physical and biological parameters. Some of the monitoring is required by permit approvals, and some biological monitoring is desirable from a scientific perspective, but is not a requirement. Extensive pre-project physical and biological monitoring of all parameters has been completed to establish baseline conditions. Required physical monitoring is

being conducted by Coastal Geologic Services. Parameters include sediment grain size sampling, beach topography and profiles to track sediment movement, including landslide inputs from the upland. Required biological monitoring includes eelgrass surveys and forage fish spawning surveys to track their response to the restoration of the sediment supply. Eelgrass monitoring is being conducted by Anchor Environmental. Forage fish spawning surveys are being conducted by Joe Weiss of the Marine Technology Center, a public school funded vocational center located within the park. Pre-construction forage fish monitoring yielded no evidence of sand lance or surf smelt spawning within the project area. Required monitoring is designed to address relationships between physical and biological parameters (e.g. changes in sediment supply on eelgrass beds and forage fish spawning activity). Required monitoring will continue for five years.

Other, desirable, but not required, post-construction biological monitoring (enhanced biological monitoring) would build on pre-construction baseline monitoring that included beach seining for juvenile salmon by King County and epibenthic sampling by the University of Washington Wetland Ecosystem Team. Pre-construction epibenthic sampling of the project area and adjacent reference sites showed that the quantity and diversity of salmon prey items were much lower at the sampling station most impacted by the gabion bulkhead/rock rip-rap revetment, as compared to the reference sites (reference Toft report). Further monitoring will be needed to show if there is a significant change post-construction at this same sampling station. Enhanced monitoring of post-construction conditions will be dependent upon additional partner agency funding, which has not been secured.

### **Planned Response to Landslide Activity:**

During the permit approval process for Corps construction, the City developed a landslide response policy consistent with the intent of the master plan (USACE 2003 and Anchor Environmental 2002b). The policy applies to restored and undeveloped shoreline segments of the park, and is designed to allow soils and woody debris to enter the nearshore ecosystem and be naturally transported through the driftcell. This policy emphasizes leaving materials that reach the beach in place and allowing natural high tides and waves to entrain sediment into the littoral system. Landslide materials that block the reconstructed 8- foot wide crushed rock trail will be moved to the upper edge of the beach above the Mean Higher High Water/Ordinary High Water line. In this elevation band, permit approvals are not needed to place the material there, but soils and woody debris can be reached by high tide/storm conditions occurring periodically during any given year.

### **Summary and Conclusions:**

Seahurst Park provides a living laboratory for studying Central Puget Sound nearshore restoration. The re-activation of the bluff-to-beach sediment supply mechanism has broad applicability to Puget Sound nearshore ecology. Monitoring the physical and biological response to this restoration action, following 30 years of bulkheading and rock armoring, will offer valuable lessons about the effectiveness of nearshore restoration supporting juvenile salmon, eelgrass, and forage fish.

### **References**

Anchor Environmental, 2002a, *Seahurst Park Master Plan Appendix B – Site Background Information Technical Memorandum*, Prepared for City of Burien, August 2002.

Anchor Environmental, 2002b, *Seahurst Park Master Plan Summary Report*, Prepared for City of Burien, August 2002.

Brennan, J.S., K.F. Higgins, J.R. Cordell, and V.A. Stamatiou, 2004, *Juvenile Salmon Composition, Timing, Distribution, and Diet in Marine Nearshore Waters of Central Puget Sound in 2001-2002*, King County Department of Natural Resources and Parks, Seattle, Washington, August 2004.

Coastal Geologic Services, 2004, *Seahurst Park Seawall – Beach Monitoring: Pre-Construction Survey*, Prepared for Anchor Environmental and the U.S. Army Corps of Engineers, December 24, 2004.

Keuler, R.F., 1988, Map showing coastal erosion, sediment supply, and longshore transport in the Port Townsend 30- by 60-minute quadrangle, Puget Sound region, Washington: US Geological Survey Miscellaneous Investigations Map I-1198-E, scale 1:100,000.

USACE, 2003, *Final Environmental Assessment for Nearshore Restoration at Seahurst Park, Burien, Washington*. August 2003.

Williams, G.D., R.M. Thom, J.E. Starkes, et al. 2001, *Reconnaissance Assessment of the State of the Nearshore Ecosystem: Eastern Shore of Central Puget Sound, Including Vashon and Maury Islands (WRIAs 8 and 9)*. J.S. Brennan, editor. Prepared for King County Department of Natural Resources, Seattle, Washington.